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Ash

Forest Service

U. S. DEPARTMENT OF AGRICULTURE

ASH

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Division of Forest Products

The wood of ash is important principally because of its strength, hardness, stiffness, and shock-resisting ability. These properties, combined with excellent bending qualities and suitable weight, make it especially valuable for agricultural tool handles and for vehicle construction. Freedom from odor and taste also makes ash well suited to butter-tub construction, one of its important uses.

There are about 18 species of ash native to the United States. Seven species are of some commercial importance. Three of these—white ash, green ash, and black ash—are of major commercial importance and probably furnish more than 90 percent of the ash lumber produced in the country. These three species grow principally in the eastern half of the United States. The tree lends itself readily to both natural and artificial reproduction, has a good rate of growth under proper conditions, responds well to thinnings made to increase its rate of growth, and is comparatively free from attacks of insects and diseases. Extensive cutting of ash has already brought about a condition where the normal demand exceeds the supply. The center of production of ash lumber, formerly in the Lake States region, has shifted steadily southward and is now in the lower Mississippi Valley.

Nomenclature.—The commonly accepted names, botanical names, and several other names often used for each of the seven species of ash of principal commercial importance are as follows:

Common Name	*Botanical Name*	*Other Names*
White ash	*Fraxinus americana*	Ash. American ash. Cane ash.
Green ash	*Fraxinus pennsylvanica* var. *lanceolata*	Ash. White ash. Swamp ash. Water ash. Blue ash.
Black ash	*Fraxinus nigra*	Brown ash. Hoop ash. Basket ash. Swamp ash. Water ash. Ash.
Blue ash	*Fraxinus quadrangulata*	Ash.
Pumpkin ash	*Fraxinus tomentosa*	None.
Biltmore ash	*Fraxinus biltmoreana*	Ash. White ash.
Oregon ash	*Fraxinus oregona*	Ash.

All of the seven species are usually sold as "ash." The term "white ash" is generally applied to wood that is heavy, strong, and tough and excludes the lighter wood, especially that cut from black ash and pumpkin ash. The term "pumpkin ash" is frequently used to designate wood that is light in weight and brittle. Such wood is generally cut from large trees grown in wet river bottoms.

Distribution and growth.—Of the seven commercial species of ash, six are found in the eastern half of the United States (figs. 1, 2, 3, 4, 6, 7). One (Oregon ash) occurs on the Pacific coast (fig. 8). Ash generally grows in mixture with other species and forms only a small proportion of the stand. The rate of growth varies widely with conditions. White ash on the uplands of New York reaches an average diameter of 1.3 inches and an average height of 17 feet in 10 years. Green ash on the river bottoms of South Carolina has been found to attain an average diameter of 2.4 inches and an average height of 26 feet in 10 years. In general, ash grows rapidly on favorable sites, reaching a height of 60 to 80 feet and a diameter of 10 to 20 inches in 40 years. In favorably located virgin stands, mature ash trees 200 to 300 years old, 5 to 6 feet in diameter, and 125 to 175 feet in height, were formerly not uncommon. A tree 3 feet in diameter is now considered very large.

All species of ash thrive best on moist, well-drained, fertile, porous soils. The different species vary in their ability to grow on very wet or on dry soils. Ash reproduces principally by seed, which it bears freely, usually every other year, but also by sprouting from stumps. Reproduction from seed is generally confined to spots where the soil or leaf litter is liberally supplied with moisture. For the first few years

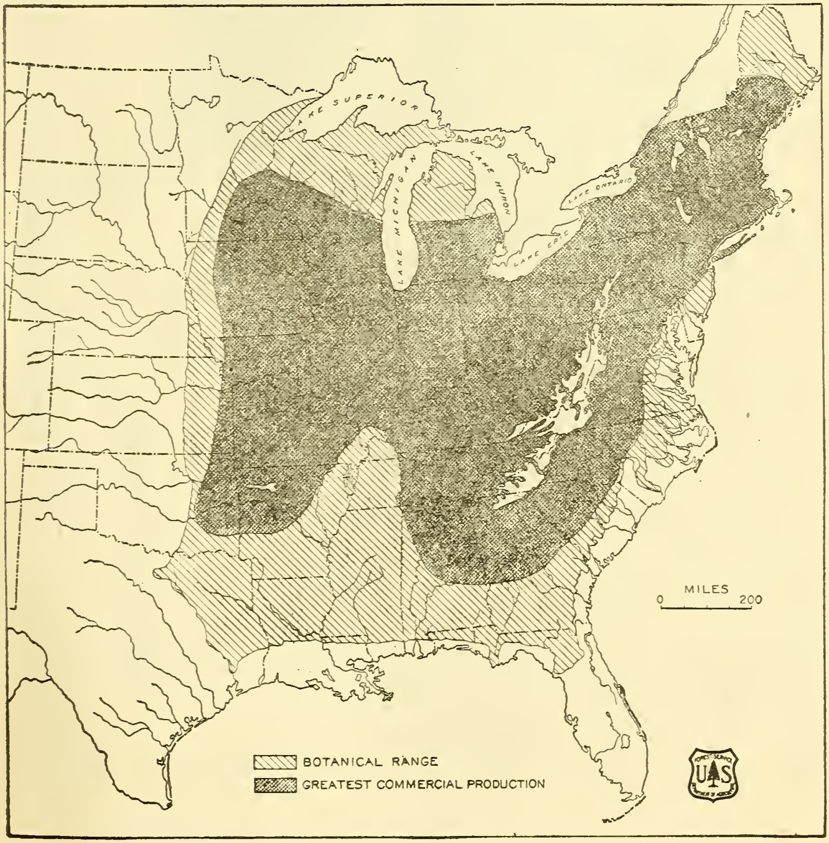

FIGURE 1.—Range of white ash (*Fraxinus americana*).

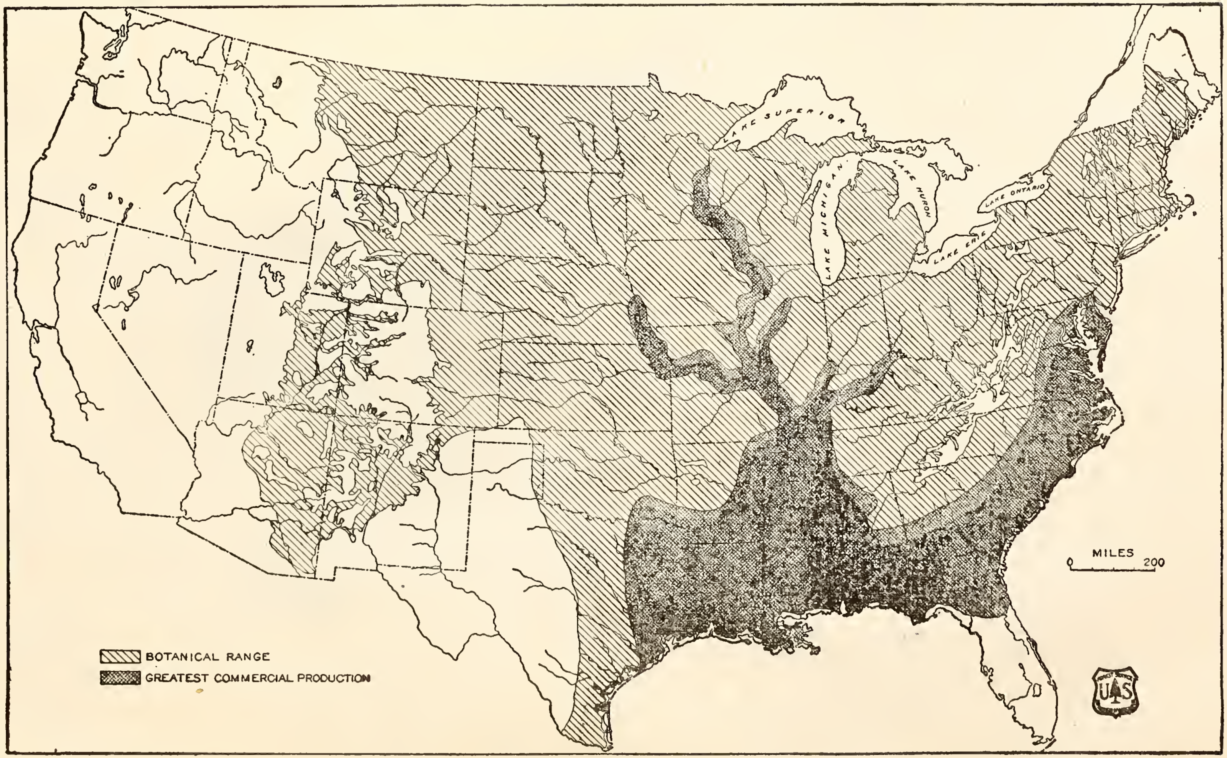

FIGURE 2.—Range of green ash (*Fraxinus pennsylvanica* var. *lanceolata*).

ash does best where the soil is shaded. After reaching pole size it needs considerable light for best development. With plenty of light the growth is faster and the wood produced is heavier and stronger. The sensitiveness of ash to light conditions makes it readily responsive to forest management.

Supply.—The total stand of ash saw timber in the United States is estimated very roughly at 8 billion board feet, made up as follows:

Region:	*Stand in board feet (International ¼-inch scale)*
Deep South:	
Alabama	214, 300, 000
Arkansas	538, 800, 000
Florida	250, 000, 000
Georgia	147, 700, 000
Louisiana	771, 700, 000
Mississippi	344, 500, 000
Oklahoma	21, 300, 000
Texas	277, 900, 000
	[1] 2, 516, 200, 000
Lake States	[2] 1, 000, 000, 000
Remainder of ash range	[3] 4, 500, 000, 000
Total	8, 016, 200, 000

[1] This figure, with the exception of the Florida stand, is based on the results of a forest survey in the Southeastern States by the Southern Forest Experiment Station of the U. S. Department of Agriculture as part of a Forest Survey of the United States. The stand of ash in Florida in the southern survey reports was not listed separately. The Florida stand estimate is based largely on the ratio of the average annual cut of ash to the stand of ash in nearby States. The ash included in the southern survey was largely green ash and white ash.

[2] This figure is based on a survey by the Lake States Forest Experiment Station of the U. S. Forest Service as part of a Forest Survey of the United States. The survey showed a stand of 1,776,280,000 board feet of miscellaneous hardwoods, principally ash, hickory, and hophornbeam, in addition to the more abundant hardwoods listed individually. Of this amount, it is estimated that 1,000,000,000 feet is ash—largely black ash.

[3] This is a rough estimate based on the size of the remainder of the ash range, especially the commercial range, as compared to the range already covered. The estimate is, of course, subject to change as more definite information on the stand of ash in the area becomes available. The remaining ash range includes all the States except those in the deep South and the Lake States. It comprises about two-thirds of the commercial range of white ash, about one-half of the commercial range of black ash, and part of the commercial range of green ash. It includes South Carolina, Tennessee, West Virginia, Pennsylvania, and other States that have ranked high in the production of ash lumber.

It was estimated in 1917[4] that two-thirds of the supply of ash of saw-timber size was second-growth material chiefly in small timber tracts and farm woodlands, and about one-third was virgin timber chiefly in large tracts.

Production of Lumber.—The cut of ash lumber in 1899[5] was 275,613,000 board feet (fig. 5). It declined from 1900 to 1905, but rose to a maximum of 291,209,000 board feet in 1909 and then fell off irregularly. In 1932[6] it fell to 34,364,000 feet. Production in 1942 was 117,406,000 board feet, reported from 36 States. The average annual cut of ash for lumber for the 10-year period 1933–1942 was approximately 88,000,000 board feet. Michigan held first place in the production of ash lumber from 1899 to 1909, when it was displaced by Arkansas. From 1909 to 1920 either Arkansas or Louisiana ranked first.[7] From 1920 to 1930 Louisiana was the leading State, with Arkansas second. Since then, either South Carolina or Louisiana has been first, except in 1934, when Mississippi reported the greatest cut.

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[4] STERRETT, W. D. UTILIZATION OF ASH. U. S. Dept. Agr. Bul. 523, 52 pp., illus. 1917.

[5] Earliest year for which statistics of the Bureau of the Census on ash are available.

[6] A year of business depression.

[7] Except in 1911 and in 1912 when Ohio was first.

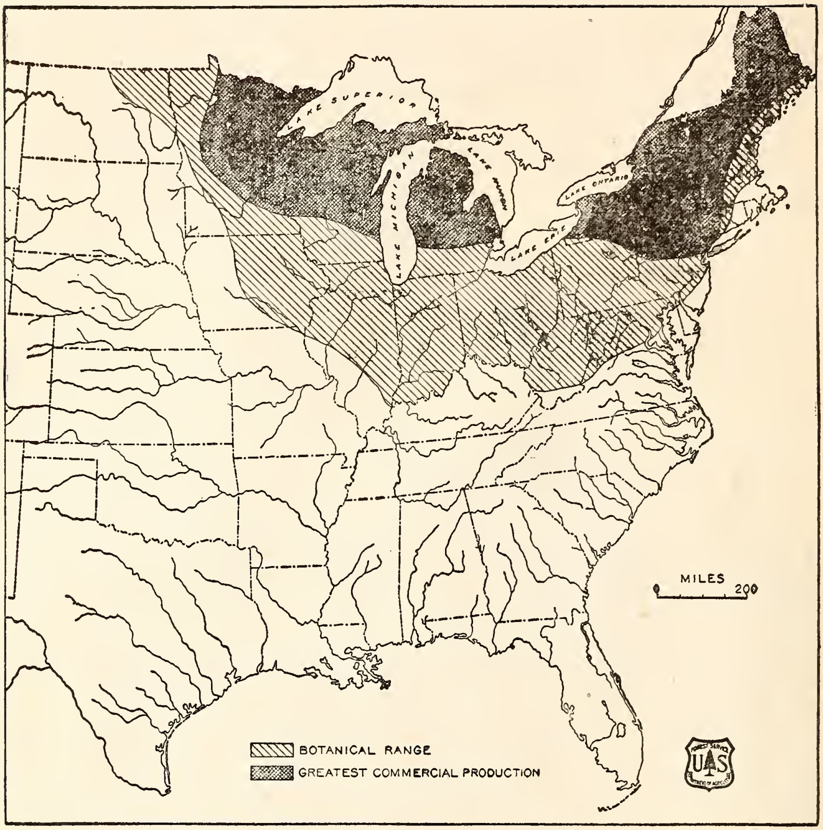

Figure 3.—Range of black ash (*Fraxinus nigra*).

The southward movement of the center of production of ash lumber is quite evident. In 1942 the three leading States—South Carolina, Louisiana, and Mississippi—supplied over one-quarter of the ash lumber produced. It is probable that at least 40 percent of the cut is white ash, about 33 percent green ash, and nearly 20 percent black ash. The remaining ashes of some commercial importance probably make up less than 5 percent of the cut.

Cooperage.—Ash is used in the manufacture of both slack and tight cooperage. Production of ash slack staves has varied from a maximum of 83,022,000 staves in 1918 to a minimum of 12,214,000 staves in 1935.[8] Production in 1927, 1929, 1931, and 1935 averaged 40,167,000 staves per year. The production of slack heading in 1919, 1921, 1923, and 1925[9] averaged 2,430,000 sets per year. For tight cooperage the average annual production about 15 years ago[10] was 4,627,000 staves and 742,000 sets of heading. The annual production of both tight and slack ash cooperage has probably been considerably reduced in recent

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[8] Latest year for which statistics on ash slack staves are available.

[9] Latest year for which statistics on ash slack heading are available.

[10] Average includes years 1923, 1925, 1927, and 1929. More recent statistics for tight cooperage do not list ash separately.

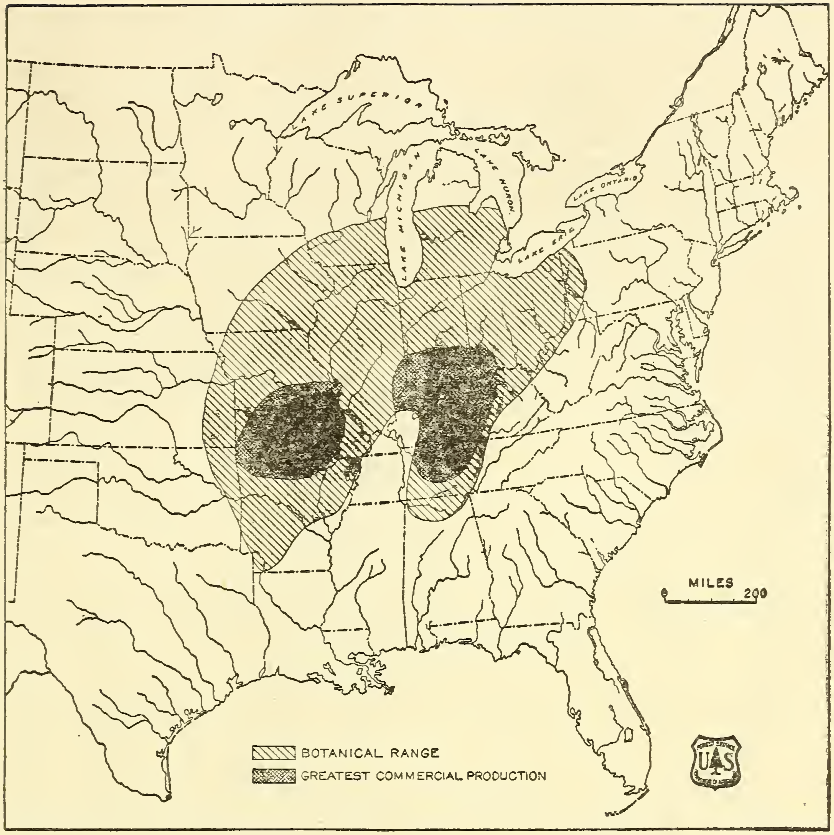

FIGURE 4.—Range of blue ash (*Fraxinus quadrangulata*).

years and is estimated roughly as equivalent to one-half the averages given, or the equivalent of approximately 13 million board feet.[11]

In addition to the ash used for lumber and cooperage, a considerable amount is used in the form of short lags or bolts,[12] largely in the manufacture of handles. The amount so used is probably at least half as much as for lumber. In 1940 it amounted to about 40 million board feet.[13] Additional but smaller amounts of ash are used for veneer, railway ties, fuel, fence posts, and other purposes. The average annual volume of ash used for all purposes in recent years is estimated at 170 million board feet.

Properties.—The heartwood of ash is brown and in sharp contrast to the light-colored sapwood. The proportion of heartwood and sapwood varies chiefly with the age of the tree. Old-growth trees over 150 years of age have a narrow band of sapwood usually less than 2 inches wide. Second-growth trees less than 100 years and over 12 inches in diameter generally have from 3 to 6 inches of sapwood. White ash and green ash lumber is generally cut from rapid-growing, second-growth trees and is largely wide-ringed sapwood. Black ash lumber, which is usually cut from old, slow-growing trees, is mostly dark-colored heartwood with comparatively fine grain and a pleasing figure. The "white ash" of commerce is made up largely of white ash and green ash with a small proportion of Biltmore ash and blue ash. The wood of "white ash" is heavy,[14] strong, hard and stiff and has high shock-resisting ability. In ease of working (planing, shaping, and turning), in tendency to split in nailing, and in ability to hold nails and screws it has an intermediate rank. "White ash" keeps in place well under the action of water, and its surface remains smooth. Black ash and also pumpkin ash are lighter in weight[15] and rank below the other commercial ashes in most of their strength properties. Oregon ash ranks somewhat above black ash and pumpkin ash in strength properties but below "white ash."

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[11] The following converting factors were used: 3 slack staves=1 board foot; 1 set slack heading=2 board feet; 1 tight stave=3 board feet; and 1 set tight heading=4 board feet.

[12] These short logs or bolts go directly to manufacturers of handles and other wood products and not to sawmills, and hence are not included in the lumber production reports of sawmills.

[13] The reported production of ash lumber in 1940 was approximately 84 million board feet.

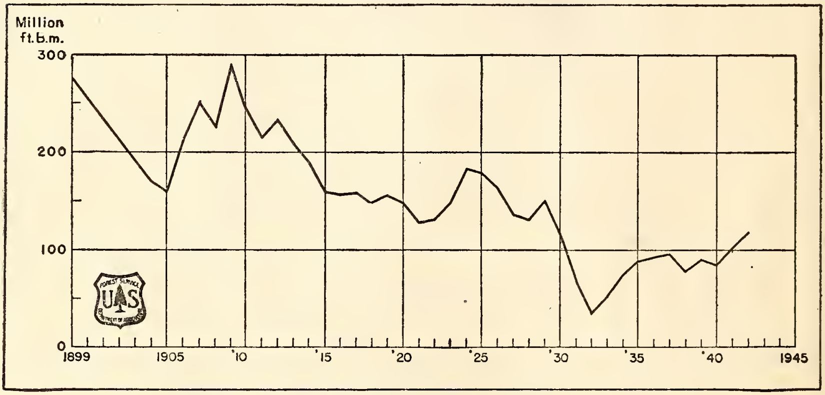

Figure 5.—Lumber production of ash, 1899–1942.

Ash is not a durable wood when used under conditions favorable to decay. In durability it ranks with beech, birch, maple, and spruce. Ash shrinks and swells somewhat less than yellow birch, sweetgum, sugar maple, and white oak and somewhat more than black walnut. The seasoned sapwood is subject to attack by powder-post beetles which burrow through it. Damage by these beetles can be largely obviated by proper storage and inspection. Ash lumber can be rapidly and satisfactorily kiln-dried and holds its shape well. The wood has excellent bending qualities. In steam bending, a common method, the wood is rendered flexible by the application of heat and moisture and while in this condition is bent to the desired shape and so held until it has dried and the shape has become fixed.

Principal uses.—Ash is used principally for handles; cooperage; furniture; motor-vehicle parts; boxes, baskets, and crates; and sport-

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[14] Average weight air-dry (12 percent moisture), white ash—42 pounds per cubic foot; green ash—40 pounds per cubic foot.

[15] Average weight air-dry (12 percent moisture), black ash—34 pounds per cubic foot; pumpkin ash—36 pounds per cubic foot.

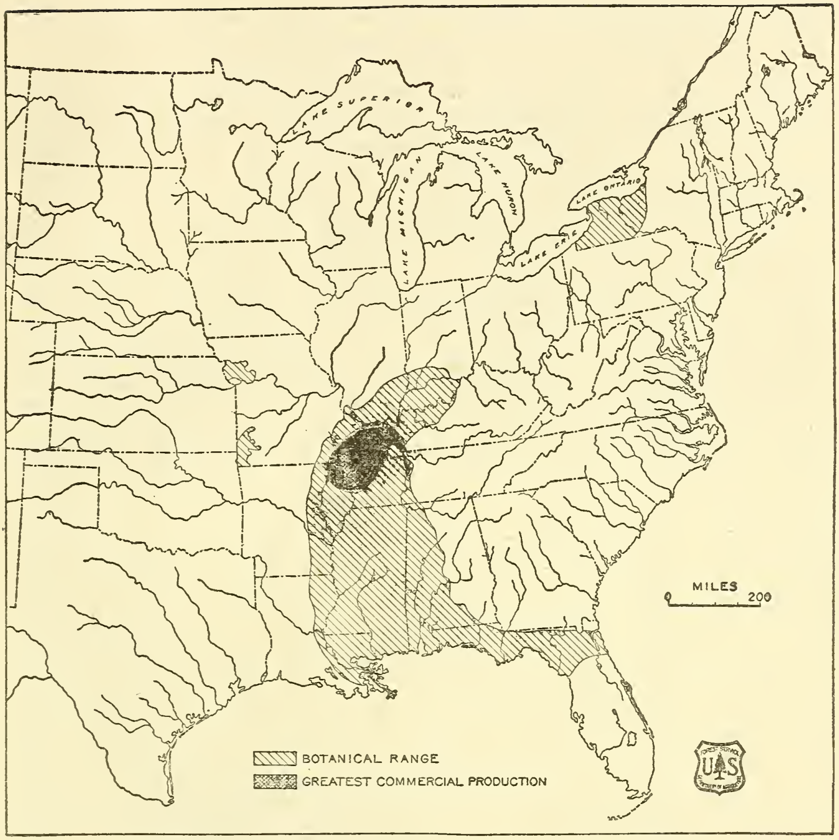

FIGURE 6.—Range of pumpkin ash (*Fraxinus tomentosa*).

ing and athletic goods. It is also used for railroad ties, veneer, and fuel.

Ash is the standard wood for certain classes of handles such as "D" handles for shovels and spades and long handles for forks, hoes, rakes, and shovels. It is practically the only wood used for snaths and cradles. Rapid-growing, second-growth white and green ash are most often used. The qualities which make them especially suitable for handles are straightness of grain, stiffness, strength, hardness, good bending properties, and capacity to wear smooth in use.[16] Ash (principally white and green) was formerly widely used for wagon parts such as poles, shafts, trees, braces, bows, and bottom boards and also for automobile frame parts requiring good bending qualities and strength. Many of these parts are now made of steel, especially in automobiles. For vehicle panels old growth is preferred. Ash for cooperage goes principally into slack staves and heading and to a less extent into tight staves and heading, principally for butter tubs.

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[16] The Federal Specifications for ash handles for shovels, hoes, forks, and rakes provide for three grades. In the highest grade there must not be less than 5 or more than 17 annual rings per inch of radius when measured on a cross-section of the handle. The weight of the wood in the handles when thoroughly air-dry must be over 43 pounds per cubic foot, and the grain must not cross the handle within its length. A few minor scattered defects are allowed.

For planing-mill products, including interior trim of various kinds, and cabinet work, old-growth ash (especially black ash) is generally preferred because it retains its shape better than second-growth material, can be obtained in larger sizes, and has sufficient strength for such uses. Ash is used for a variety of furniture, including tables and chairs—especially for bent parts. It has the quality of being easily split into thin strips which are tough and elastic and find use for chair seats. Such strips are also used in making baskets. For baseball bats, tennis racket frames, snowshoes, skis, polo sticks, hockey sticks, bows, and other sporting goods, ash has a wide use. For high-grade baseball bats it is used almost to the exclusion of other woods. Practically all long oars and sculls and a large proportion of short oars and paddles are made of ash. Drain boards connected with sinks and laundry appliances are often made of ash, and "white ash" has proved thoroughly satisfactory for uses where it is subjected to the action of water. Black ash, however, is not suitable for such uses

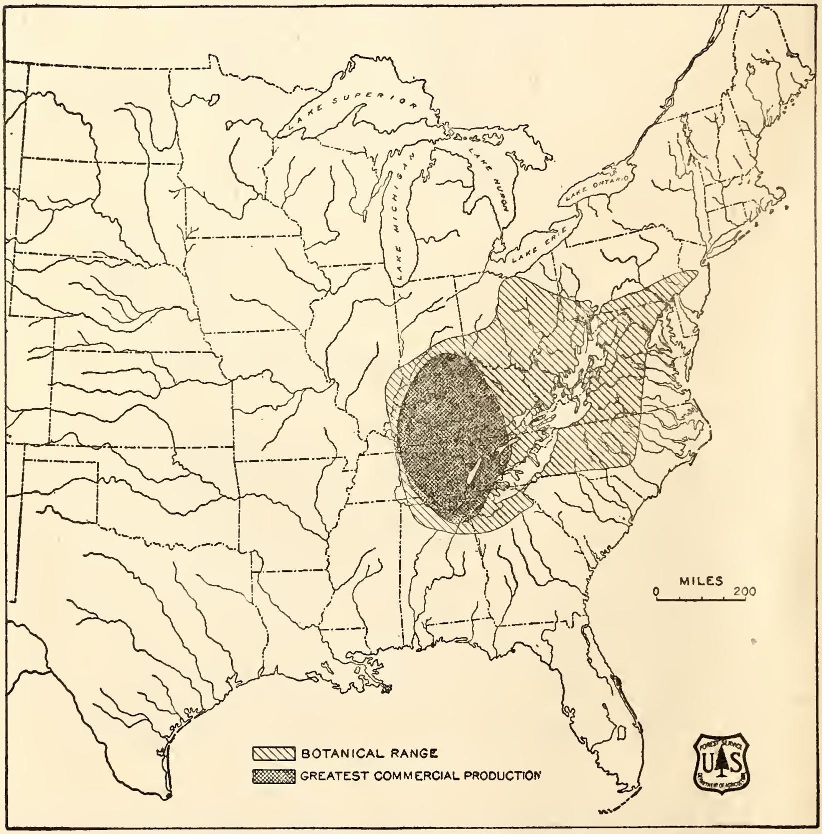

Figure 7.—Range of Biltmore ash (*Fraxinus biltmoreana*).

as it may become soft and spongy. "White ash" is used in airplane construction for various frame parts. Only the highest quality of clear, straight-grained wood is suitable.

Table 1 shows the amounts of ash used in the manufacture of wooden products in 1912, 1928, 1933, and 1940. The tabulation includes ash in the form of lumber, logs, bolts, and veneer.

TABLE 1.—*Ash used in the manufacture of wooden products*

[Thousands of board feet]

Classes of products	1912	1928	1933	1940
Airplanes	12	149	----------	----------
Agricultural implements	10, 677	9, 736	394	1, 545
Boxes, baskets and crating	10, 507	13, 854	[1] 2, 898	[1] 9, 402
Boxes, cigar and tobacco	----------	----------	----------	----------
Butchers' blocks	[2] 20	(2)	----------	----------
Car construction and repair	18, 163	4, 153	1, 420	1, 029
Caskets and burial boxes	20	1	----------	146
Conduits, pumps and wood pipe	976	----------	523	2, 184
Dairy, poultry, and apiary supplies	(3)	2, 070	1, 435	1, 793
Dowels and skewers	[4] 29	[4] 51	----------	499
Electrical equipment	87	567	177	116
Fixtures	2, 784	561	132	490
Flooring	(5)	(5)	51	435
Furniture	18, 434	13, 866	7, 937	17, 279
Handles	64, 430	34, 481	27, 627	62, 483
Instruments, musical	2, 377	229	36	5
Instruments, professional and scientific	124	72	35	27
Ladders	(3)	(3)	158	586
Laundry appliances	112	102	68	1
Machinery	2, 111	86	4	96
Patterns and flasks	35	2	----------	25
Playground equipment	180	110	5	41
Plumbers' woodwork	536	855	30	250
Printing material	391	255	----------	----------
Radio and phonograph cabinets	(6)	(6)	5	4
Refrigerators	[7] 19, 066	[7] 19, 808	2, 686	142
Rollers, shade and map	161	4	----------	100
Sash, doors, general millwork	[8] 21, 587	[8] 7, 583	[9] 223	[9] 668
Sewing machines	----------	----------	296	21
Ship and boat building	7, 986	2, 873	824	3, 404
Shuttles, spools, bobbins, looms	[10] 437	[10] 11	(10)	612
Signs, scenery, displays	----------	----------	10	----------
Sporting and athletic goods	3, 180	8, 604	4, 671	8, 251
Surgical supplies	----------	73	----------	111
Tanks	886	----------	----------	----------
Toys	895	468	670	2, 544
Trunks and valises	534	----------	10	56
Vehicles, motor	(11)	53, 551	6, 729	10, 714
Vehicles, nonmotor	43, 975	3, 752	172	1, 025
Woodenware and novelties	64, 769	2, 052	326	3, 099
Total	295, 461	179, 979	59, 552	[12] 129, 183

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[1] These figures for 1933 and 1940, although smaller than similar figures for 1912 and 1928, include ash used for boxes and crates by plants not classified as manufacturers of wooden products and which were not included in 1912 and 1928. The amounts included for non-manufacturers of wood products were as follows: for 1933—60,000 board feet, and for 1940—1,822,000 board feet.

[2] Includes skewers.

[3] Included in "Woodenware and novelties."

[4] Dowels only, skewers included in "Butchers' blocks."

[5] Included in "Sash, doors, general millwork."

[6] Included in "Furniture."

[7] Includes kitchen cabinets.

[8] Includes planing mill products such as flooring, ceiling, siding, etc.

[9] Planing mill products not included in 1933 and 1940 canvasses except flooring, which is listed separately.

[10] Does not include looms.

[11] Included in "Vehicles, nonmotor."

[12] This figure includes 88,238,000 board feet of lumber, 40,569,000 board feet of logs and bolts, and 376,000 board feet of veneer.

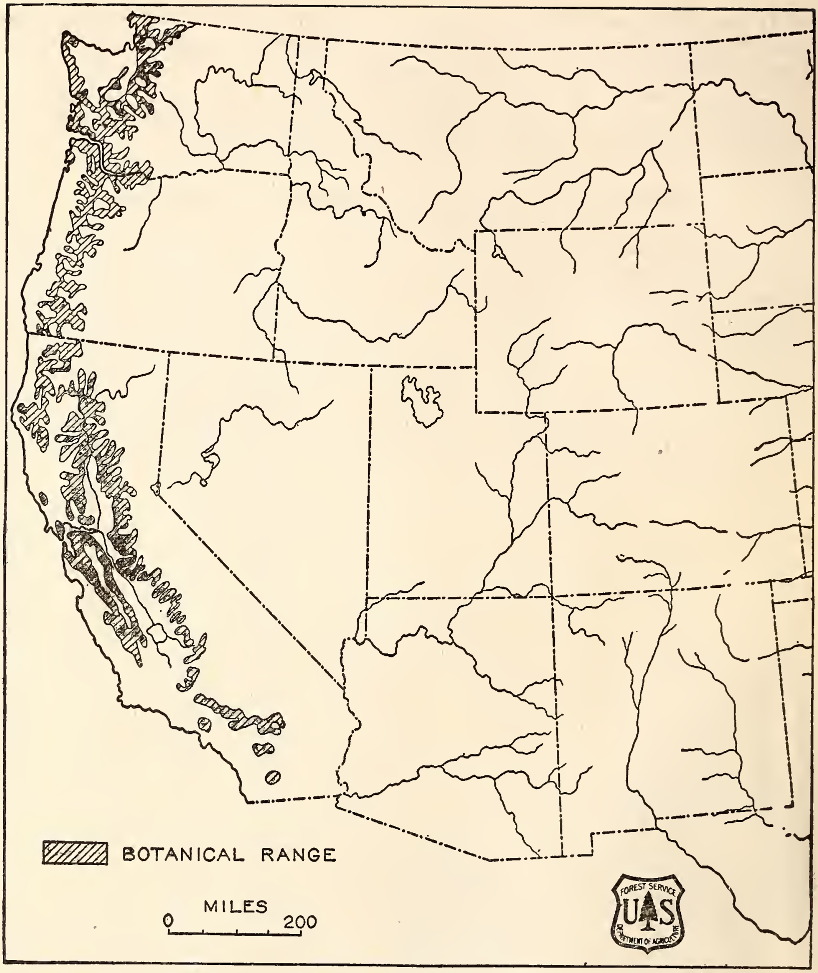

Figure 8.—Range of Oregon ash (*Fraxinus oregona*).

REFERENCES

THE ASHES: THEIR CHARACTERISTICS AND MANAGEMENT. W. D. Sterrett. U. S. Dept. Agr. Bul. 299, 88 pp., illus. 1915.

LUMBER USED IN MANUFACTURE—1928, 1933, AND 1940. (Summary tables.) U. S. Forest Service Preliminary Statistics—Forest Survey of the United States.

LUMBER USED IN THE MANUFACTURE OF WOODEN PRODUCTS. J. C. Nellis. U. S. Dept. Agr. Bul. 605, 18 pp., illus. 1918.

PREVENTING DAMAGE BY LYCTUS POWDER-POST BEETLES. T. A. Snyder. U. S. Dept. Agr. Farmers' Bul. 1477, 14 pp., illus. 1926, rev. 1938.

STRENGTH AND RELATED PROPERTIES OF WOODS GROWN IN THE UNITED STATES. L. J. Markwardt and T. R. C. Wilson. U. S. Dept. Agr. Tech. Bul. 479, 99 pp., illus. 1935.

UTILIZATION OF ASH. W. D. Sterrett. U. S. Dept. Agr. Bul. 523, 52 pp., illus. 1917.

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